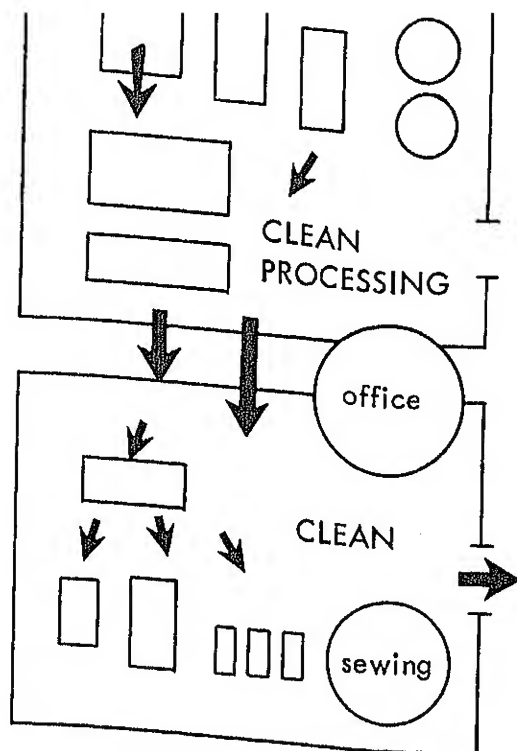


Laundry for a 75-bed hospital. (See fig. 3.)



THE HOSPITAL LAUNDRY

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

Public Health Service

Division of Hospital and Medical Facilities
Architectural, Engineering, and Equipment Branch

Washington, D.C. 20201

Public Health Service Publication No. 930-D-24

November 1966

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402 - Price 25 cents

FOREWORD

An efficient hospital laundry is essential for providing an adequate supply of clean linen for today's expanding hospitals. The many innovations continually being made in hospital procedures and in concepts of laundry design and operation pinpointed the need for a publication presenting the most up-to-date guidelines for the hospital laundry. A survey was therefore made to determine the latest thinking and practices in hospital laundries throughout the country.

Over a 2-year period, more than 100 short-term general hospital laundries were visited. The hospitals ranged in size from 50 to 2,079 beds and were located in all parts of the United States.

This publication incorporates the consensus of many of the laundry managers and hospital administrators consulted. It is offered as a guide to hospital planners, administrators, architects, and laundry managers for designing an efficient and effective laundry service for hospitals ranging in size from 75 to 300 beds.

The development of this publication is primarily the work of Miss Mary S. Sim, Hospital Facilities Equipment Advisor, who served as project coordinator. The architectural design was by Mr. Luther Flouton, Architect, and the mechanical design by Mr. Richard P. Gaulin, Mechanical Engineer. We are particularly indebted to the individuals shown in the list of acknowledgments for their counsel.



Harald M. Graning, M.D.
Assistant Surgeon General
Chief, Division of Hospital
and Medical Facilities

ACKNOWLEDGMENTS

Appreciation is expressed to the following individuals for their counsel and assistance in developing the material in this document:

Howard L. Andrews, M.D. (retired)
Chief, Radiation Safety Department
Clinical Center
National Institutes of Health
U.S. Public Health Service
Bethesda, Md.

Sister Mary Celeste, S.S.M., R.N.
Director of Laundry and Linen Service
St. Mary's Hospital
St. Louis, Mo.

C. E. Chandler, Housekeeping
Service
Veterans Administration
Washington, D.C.

Mildred L. Chase, Assistant Administrator
Charles F. Kettering Memorial Hospital
Kettering, Ohio

Sister M. DeChantal, O.S.F., Laundry
Manager
St. Joseph's Hospital
Milwaukee, Wis.

Robert J. Dobson
Laundry Manager Consultant to Institutions
New Hyde Park, N.Y.

Lucile Hall, Chief
Housekeeping and Laundry Service
Edward Hines, Jr. Hospital
Hines, Ill.

Thomas H. Keys, Chief, Laundry
and Dry Cleaning Section
National Institutes of Health
U.S. Public Health Service
Bethesda, Md.

Robert K. Lewis, Administrative
Assistant to the Executive Vice
President
Presbyterian - St. Luke's Hospital
Chicago, Ill.

A. L. Martinez, Hospital Bacteriologist
Indiana University Medical Center
Indianapolis, Ind.

Charles Reeves, Housekeeping
Service
Veterans Administration
Washington, D.C.

Gordon Shepherd, Linen Service
Manager
St. Joseph's Hospital
Victoria, British Columbia
Canada

Lee D. Stauffer, Assistant Professor and Director
School of Public Health
University of Minnesota
Minneapolis, Minn.

CONTENTS

| | <u>Page</u> |
|---|-------------|
| FOREWORD | iii |
| ACKNOWLEDGMENTS | v |
| INTRODUCTION | 1 |
| PLANNING AND PROGRAMING | 1 |
| LINEN SERVICE | 1 |
| Clean linen | 1 |
| Inventory | 1 |
| Marking | 2 |
| Distribution | 2 |
| Issue systems | 2 |
| Transportation methods | 3 |
| Manufacturing | 3 |
| Repair | 3 |
| Pack preparation | 3 |
| Control | 3 |
| Soiled linen | 4 |
| Collection | 4 |
| Sorting | 4 |
| Laundering special items | 5 |
| PERSONNEL | 5 |
| Method of determining approximate number of personnel required | 7 |
| EQUIPMENT | 8 |
| SUPPLIES | 8 |
| Type | 8 |
| Storage and issue | 9 |
| PROCUREMENT OF SUPPLIES AND EQUIPMENT | 9 |
| ARCHITECTURAL ASPECTS | 9 |
| Design for asepsis | 9 |
| Physical plant | 15 |
| Location of laundry | 15 |
| Technique and space requirements | 16 |
| Materials and decor | 19 |
| MECHANICAL CONSIDERATIONS | 20 |
| Steam | 20 |
| Water | 20 |
| Compressed air | 21 |
| Plumbing | 21 |
| Ventilation | 21 |
| ELECTRICAL SERVICE | 22 |
| Power supply | 22 |
| Lighting | 22 |
| Communications | 23 |
| FIRE SAFETY FACTORS | 23 |
| PLANT MAINTENANCE | 23 |
| COST OF OPERATION | 23 |
| SUGGESTED EQUIPMENT LIST | 25 |
| REFERENCES | 28 |

FIGURES

| | <u>Page</u> |
|--|-------------|
| 1. Laundry workload charts | 6 |
| 2. Workflow diagram for processing hospital linen showing the various positions or functions through which the soiled linen must pass when the double-door washer-extractor technique is used | 10 |
| 3. Laundry for a 75-bed hospital | 11 |
| 4. Laundry for a 200- to 300-bed hospital | 13 |
| 5. Single-door washer-extractor system | 14 |
| 6. Mezzanine sorting overhead hopper loading system | 15 |

INTRODUCTION

Cleanlinen is a necessity in the effective operation of a hospital, and therefore, the hospital linen service is a major concern of the hospital administration and staff. This service may be provided through the hospital laundry, a hospital cooperative laundry, a commercial laundry, or a complete linen service supplier. This publication will deal with the provision of this service by the laundry owned and operated by the hospital.

The hospital laundry is responsible for providing an adequate, steady, and safe supply of linen when and where it is needed. This is not a simple procedure because the laundry management must consider the needs of most of the other serv-

ices in the hospital. The supervisors of nursing, surgery, obstetrics, laboratory, X-ray, dietary, emergency, administration, central medical and surgical supply, and others may have widely different ideas on the operation of the linen service. Thus, a cooperative relationship between the supervisory personnel of these units and the laundry personnel must be maintained to facilitate its smooth operation. This must be expressed in written principles and policies by the governing body and the hospital administration.

Certain basic factors which contribute to satisfactory linen service in the hospital are discussed in detail in the following pages.

PLANNING AND PROGRAMING

Many errors can be avoided if a definite program is written and agreed upon by all concerned before the hospital laundry reaches the architect's drawing board. This should be done whether the project is the construction of a new laundry or the modernization of an existing facility. The hospital administrator, the responsible board members, the architect, the mechanical engineer, the laundry manager, and the laundry consultant, if employed, should comprise the planning group.

Once the program is agreed upon, it is most important that the hospital administrator or his

designate, the laundry manager, the executive housekeeper, the director of nurses, and any other members of the hospital staff directly involved in the hospital linen service, develop a manual of operation. This manual should be completed and in writing at the time the laundry is open for operation. Training meetings should be held with all supervisory personnel to acquaint them with the hospital linen service operation.

The success of the laundry operation and the total linen service may well depend on early planning and programing.

LINEN SERVICE

Processing soiled linen in the laundry is only part of the complete linen service. The collection of soiled linen and the distribution of clean linen with all associated activities are normally responsibilities of the hospital linen service.

Centralization of the linen service under one department head reporting either to the administrator or to an assistant administrator, who has the responsibility for all service activities of the hospital, provides a more effective and efficient service.^{1, 2} However, in small hospitals it may be economically feasible to combine the linen service with some other service and assign one supervisor to oversee two or more services.

CLEAN LINEN

Inventory

A satisfactory and economical linen service is dependent on an adequate inventory of linen.³ Six complete sets of linen per patient, not including any linen in general storage, are required, based on a 100 percent hospital occupancy and a 40-hour laundry workweek. This would permit sets to be allotted as follows:

- 1 set on patient's bed
- 1 set enroute to laundry
- 1 set in process in laundry

- 1 set ready for use
- 2 sets in active storage for weekend use or emergencies

Maintenance of this inventory with immediate replacements when needed will allow for rotation of linen, which adds to its life. ⁴ Linen requirements elsewhere in the hospital should be based on the anticipated load of the department; for example, number of surgical procedures and type, number of deliveries, and number of emergency cases, with allowance made for any unforeseen combination of circumstances which might call for immediate additional linen. Many problems from unsatisfactory linen service, other than an inadequate inventory, may be reduced by standardization in type, quality, size, identification, change, or replacement procedures.

Marking

Hospital identification should be large enough to be easily seen. "Center of the piece" woven identification of linen is more expensive, but can-

Distribution

A prearranged schedule for the delivery of clean, fresh linen to the using units should be established. The responsibility for this activity should be given to one department, preferably the laundry. The selection of the type and capacity of the clean linen distribution carts should depend on the clean linen requirements of the using unit. Some units, such as patient care, will require a large amount of clean linen, whereas some units such as X-ray may require a smaller amount.

Any equipment used for clean linen should be covered or enclosed while it is being moved and should not be used for soiled linen.

Issue Systems

Only one system should be adopted to carry out this activity.

1. The exchange system, where all soiled linen is turned in and an equal amount of clean linen is used in exchange.



not be removed. Some hospitals have found that the use of secret markings has proven advantageous. Some type of thermal marking machine is generally accepted as being the most satisfactory method of obtaining permanent linen identification. If new linen is date-stamped at the time of issue, the life of the linen can be determined.

2. The quota or cart exchange system, by which the amount of linen required for each using department has been predetermined and that amount is delivered daily. This method requires two carts for each using unit.

3. The requisition system, where clean linen is only issued when a properly approved requisition is received.

4. The departmental system, where linen is identified by a special mark or color and restricted for use by a specific using unit.

5. The census system, by which clean linen is issued to using units based on patient census or workload.

Some hospitals issue linen to the patient care units in packs which include all the linen needed for the patient for the day. If this system is used, additional pieces of linen should be issued for emergency use. The daily pack may differ from the discharge pack used to remake the room after the discharge of the patient.

Transportation Methods

Various types of equipment are used to transport clean linen from the laundry to the using units such as linen trucks, carts, and mechanical conveyors. If linen is delivered by trucks or carts to the using units in the late afternoon or early in the morning much elevator "down time" can be eliminated, thus freeing the elevators for peak periods of patient and personnel transportation.

If trucks or carts are used for the distribution of clean linen, they should be light in weight and easily movable. Linen handling can be minimized if the transportation equipment is used for storage of the clean linen on the using units, preferably in a locked area.

Manufacturing

Whether linen items are bought already manufactured or made in the sewing room of the hospital is an administrative decision. Some items, such as special surgical drapes, wrappers, or equipment covers, might well be made more economically at the hospital.

Repair

An inspection program can contribute markedly to the life of the hospital linen. If small holes and tears in linen are discovered early and repaired immediately, the linen can be returned to use with little evidence of repair. Inspection light tables should have at least a sheet-wide viewing surface so that the sheet inspection process can be done in one operation.

All repaired linen should be returned to the soiled sorting room for a complete course of processing.

Methods of repair may vary. Small holes can be satisfactorily repaired with thermo-type patching equipment. These patches will withstand washing and sterilization.

A system of reclaiming or discarding linen not suitable for its original use should be adopted. Many hospitals use nonreclaimable linen for rags. It is recommended that linen used in this way be dyed or identified in some manner.

Pack Preparation

Lint has always been a problem in areas where linen packs are made. To overcome this problem, many hospitals have transferred this responsibility to the laundry.⁵ This method frees professional and trained surgical, delivery room, nursery, and central medical and surgical supply personnel for more technical duties, provides more space for critical areas, and reduces the number of personnel and time involved in handling clean linen.

Packs containing the linen needed for the daily care of the patient should be prepared in the clean linen and pack preparation room. The discharge pack which contains all the linen needed to complete a room for a new patient should also be prepared in the clean linen room or linen service room.

Control

Lack of effective linen control in general hospitals can nullify the attempts to establish effective controls throughout the hospital because it affects patient care, employee morale, and economic operation.

An adequate supply of linen is the basic factor in establishing effective control. Once this requirement has been determined, it is imperative that it be maintained. In determining the adequate supply of linen for the hospital, it should be borne in mind that a daily linen change can be a relatively inexpensive factor in promoting a good public relations program in the community, because hospitalized individuals are very prone

to disregard many excellent professional phases of care offered and limit their comments to the hospital's linen and food program.

An adequate supply of linen where and when it is needed will reduce the time the nurse spends in waiting for clean linen or going to the laundry to get it. Laundry personnel, in meeting critical linen shortages, may very often reduce the time cycles of the laundry processes. Improperly processed linen is usually contaminated and not safe for patient use.

The cost of laundry personnel overtime can also be reduced if the supply of linen for the day's operation is available for issue at the time it is needed.

The original linen budget, based on actual or estimated requirements, should provide for an adequate supply of linen, and changes should be made only when the history of operation warrants them.

A laundry committee can help to determine an adequate linen supply, establish controls, and resolve other problems relating to the linen service.

The membership of the laundry committee will depend on the organizational pattern of the hospital; however, the following members of the staff may be very helpful in giving overall consideration to the hospital's linen service: administrator or assistant administrator, director of nurses, executive housekeeper, purchasing agent, and laundry manager.

The quality of linen purchased has a direct relationship to control and rate of replacement. If a good quality linen is purchased and the laundry processing is satisfactory, the replacement rate can be minimized. Many hospitals prefer percale to muslin sheets because they are lighter in weight, softer to the patient, and will stand more washings.

If linen items are standardized in nomenclature and type as much as possible, more effective control can be exercised because there are fewer items to be accounted for, identified, and replaced. When linen wrappers are used, as few sizes as possible should be adopted.

An accurate record should be kept of replacements necessary to bring linen up to approved inventory. If replacements are high without a known basis, an investigation of the causes will be necessary.

Linen loss may be easy to control within the confines of the processing area, but after linen is issued many individuals have access to it, control becomes difficult, and the responsibility of the chief of the using unit is increased. The weekend accumulation of soiled linen can be easily stolen unless it is kept under proper security either in the collection area or in the laundry.

Good controls from the time new linens are received and marked until they are finally discarded for salvage will help reduce wanton destruction and theft.

SOILED LINEN

Collection

Certain basic requirements should always be followed in the care of soiled linen on the using units regardless of the method of transportation of the soiled linen from the using units to the laundry. All soiled linen should be bagged in the using area with sufficient space left to make a complete closure of the bag. Nylon bags can be used satisfactorily for this purpose. Although they are more expensive, they last longer than cotton bags and take up less space. If chutes or mechanical or pneumatic conveyors are not used, a well-ventilated holding area should be conveniently located on the using units for light-weight, maneuverable, easily cleaned trucks or carts, and a prearranged schedule should be adopted for soiled linen collection. The schedule should reduce the holding time of the soiled linen on the using unit as much as possible. Any transportation equipment used for soiled linen should not be used for clean linen and should be covered while in the holding area or in transit.

Sorting

Whether laundry is to be sorted before or after it is washed is a decision which must be made by hospital administration and the laundry manager. However, surveys have shown that a large percentage of laundry managers prefer to

sort laundry before washing. The sorting facilitates load balancing, standardization of formulas, flow of linen through the laundry, and recovery of instruments, utensils, and other items which inadvertently come to the laundry with the soiled linen.

Laundering Special Items

The type and number of items now coming to the laundry that need special processing, such as synthetic fabrics, radioactive linen, contaminated linen, flame retardant fabrics, and pillows are increasing. The laundry manager should become familiar with the effective special processes needed for each of these items.

The trend in hospitals today is to replace woolen blankets with cellular cotton blankets. This is very desirable as the cellular cotton blankets may be washed with regular linen formulas whereas woolen blankets require special processing and handling.

Most hospitals require that nursery linen be washed separately and sterilized before being issued to the nursery for use. Nursery linen should be given special attention in the laundry as the newborn are very susceptible to rashes that might be caused from retention of chemicals in the nursery linen.

All linen that has come in contact with a patient should be considered contaminated. However, linen that has come in contact with patients diagnosed or suspected of having a communicable disease or infection should be handled with caution and should be given special processing. The linen should be bagged and conspicuously identified at the point of use and closed so as not to contaminate the outside of the bag. If the double bag technique is used, the inner bag should be waterproof to protect the outer bag from the contaminated linen. Some types of plastic bags, disposable or nondisposable, are satisfactory for a single bag technique.

In the laundry, the adherence to a few simple rules will protect laundry personnel. The wash-

man should open the bag as carefully as possible; then, grasping the lower corners of the bag, he should empty the contents directly into the washer-extractor.

Washable bags should be put immediately into the washer-extractor. Disposable bags should be destroyed immediately by incineration. If the bag used is water soluble, it need not be opened, but may be put into the washer-extractor unopened. Immediately after putting the contents of the bag into the washer-extractor, the washman should wash his hands thoroughly with a mild germicidal soap and water.

Bags of contaminated linen should not be permitted to stand in the laundry but should be washed as soon as possible using a heavy soil formula, preferably separate from the other linen.

Laboratory tests and cultures should be made periodically on this type of linen, preferably after washing, to determine whether the washing process is making the linen hygienically safe for use in patient care and for the laundry personnel to handle.

Linen should be returned to the using units spot free. Additional attention beyond the normal washing procedures is required for stained linen. Stain removal formulas may be slightly different and more drastic than the regular formulas used, but they should not be injurious to the linen. Blood stains can be removed from the linen by introducing a cold water rinse (cold break) in the washer before hot water and washing formula are added.

Linen that may be contaminated with radioactive isotopes should be segregated and monitored with a suitable radiation detector outside the hospital laundry. If contamination is found, the articles should be put through a special washer reserved for this purpose in the using area. When they are found to be free of detectable radiation, they may be sent to the general hospital laundry and safely processed with other linen.

PERSONNEL

The maintenance of a stable and efficient work force is the ultimate goal of every employer. To

realize this goal, consideration must be given to the "3 m's" (men, machines, and methods). The

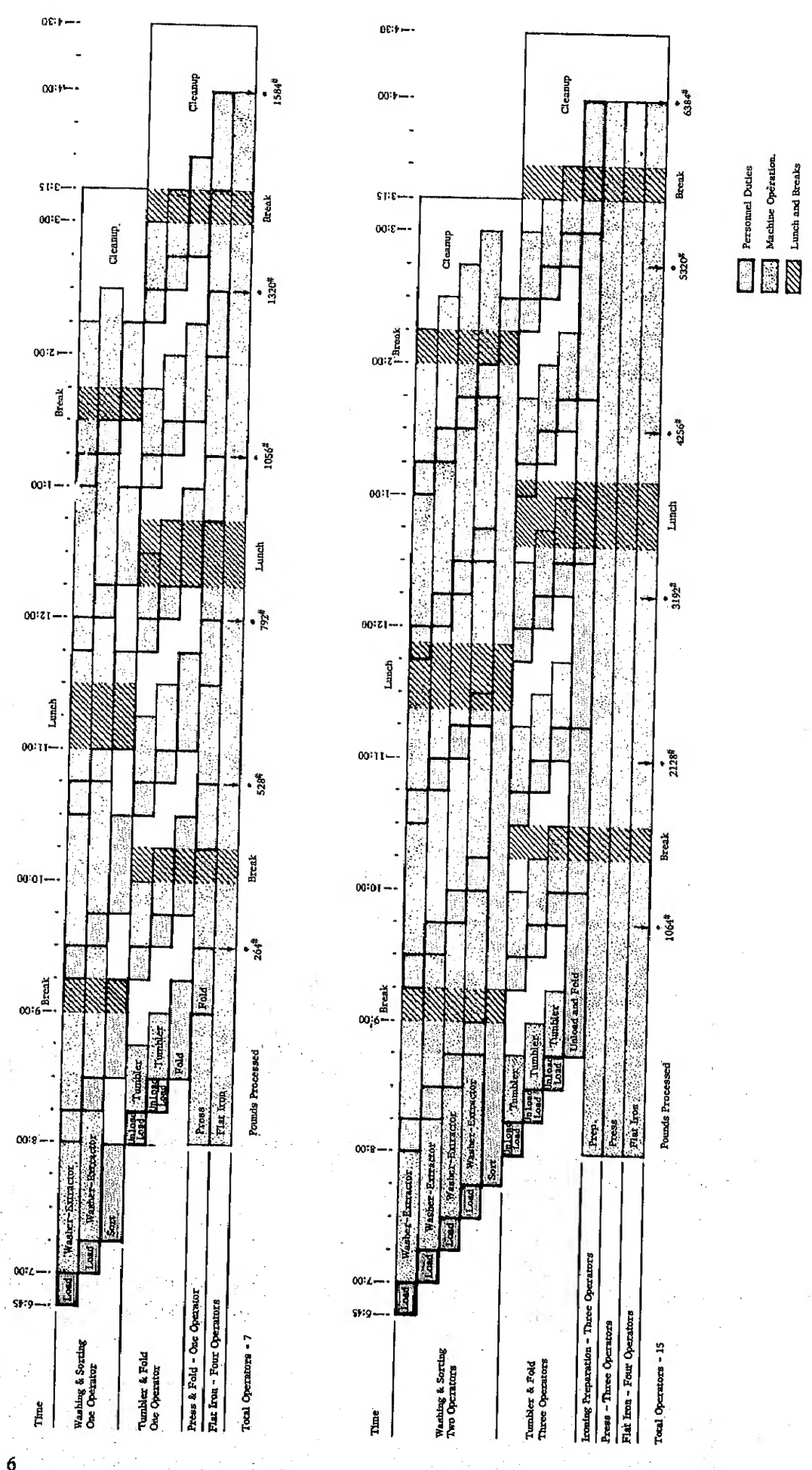


Figure 1.—Laundry workload charts.

ideal in all three is impossible; however, if major emphasis is made on the "men" part of the triune, the other parts will fall in line better.

Proper selection and assignment of personnel to a pleasant working area will help in the maintenance of a job-satisfied staff and thereby reduce costly turnover rate. Many hospitals have found that music adds to the laundry employee's morale, reduces unnecessary conversation, and increases production. In the laundry, as well as in other departments of the hospital, employees require appreciation, recognition, prestige, security, and a feeling of being part of the hospital staff.

Personnel qualifications should be in keeping with the work to be performed. Because of the type of work done in the laundry, preemployment and periodic physical examinations should be required. Salaries and fringe benefits should be in line with those in other departments of the hospital.

Laundry personnel should not be excluded from any formal hospital operated programs that might be helpful to them in performing their duties. On-the-job training should be a continuous program. Written policies, procedures, and approved individual job sheets for laundry personnel will be a definite aid in fostering good extra- and intra-departmental communication and understanding.

METHOD OF DETERMINING APPROXIMATE NUMBER OF PERSONNEL REQUIRED

The laundry workload chart, figure 1, shows the hours necessary for laundry personnel and equipment to process an established workload. It also gives a method for determining the number of personnel required based on the assumptions shown below.

The assumptions are based on the results of a survey of over 100 general short-term hospitals in the United States. The average daily soiled linen load was from 12 to 15 pounds per bed classified as follows:

- 65 to 75 percent - flatwork
- 20 to 30 percent - rough dry
- 5 to 7 percent - presswork

Approximately 80 percent of the hospitals scheduled a 40-hour workweek for laundry employ-

ees, with at least a 30-minute lunch period and from 10- to 15-minute rest periods during the midmorning and midafternoon operation. Based on assumptions derived from this information, the following calculations were used as a guide in determining personnel requirements for a general short-term hospital laundry.

75 Beds @ 100 percent occupancy

Work - 7 hours - 5 days

1575 pounds daily load = 264 pounds each
cycle (wash) at 80% of equipment rated
maximum load = 6 loads

| | | |
|---------------|---|-------------|
| Daily load | = | 1575 pounds |
| 65% flatwork | = | 1023 pounds |
| 30% rough dry | = | 472 pounds |
| 5% presswork | = | 80 pounds |

300 Beds @ 100 percent occupancy

Work - 7 hours - 5 days

6300 pounds daily load = 1064 pounds per
cycle (wash) at 80% of equipment rated
maximum load = 6 loads

| | | |
|---------------|---|-------------|
| Daily load | = | 6300 pounds |
| 65% flatwork | = | 4095 pounds |
| 30% rough dry | = | 1890 pounds |
| 5% presswork | = | 315 pounds |

EQUIPMENT

The selection of equipment should be based on the estimated volume of work, the classification of linen to be used, the operational schedule to be maintained, and the versatility desired. The selection of equipment of proper size is most important in assuring balanced production. Some of the problems brought about by hospital expansion may be reduced or eliminated if equipment selected can give greater production by increasing its utilization with additional personnel or hours of operation. The use of multisized equipment, particularly washer-extractors, permits the processing of large or small loads economically according to volume. If the volume drops off, only part of the equipment needs to be used. Multiunit equipment also permits loads requiring similar formulas to be washed together. If there is a breakdown in one piece of equipment, operation of the laundry can continue until the proper repairs are made. In larger hospitals, to accelerate production, it may be economical to add a spreader and conditioner to the equipment requirements. Labor-saving devices such as automatic formula dispensers; automatic operation controls; sorting and counting devices; folders for both large and small pieces of linen; and overhead, horizontal, and vertical conveyors can effect economies in both numbers of personnel and operational time.

The concept of management is to get the maximum utilization from both men and machines.

The equipment listed in the suggested equipment list on p. 25 would be adequate to process the peak load of soiled linen in a 40-hour workweek for the various hospital bed ranges listed, based on total bed complement, not census. Precut covers and padding for the ironer and presses as well as washing compounds, soaps, bleaches, starch, and other supplies based on individual requirements should be added to this list to complete the total needs for satisfactory linen processing.

The equipment listed is to be used as a *guide only*. This equipment list will meet the laundry needs of the size hospitals indicated under normal conditions. Hospitals should relate their equipment requirements to their own needs, which may be affected by many factors: the classification of linen, such as a large amount of presswork or no presswork; the quantity of linen for newborn babies and infants; the work schedule and workweek (five-, six-, or seven-day operation); type of patient; surgical-obstetrical load; frequency of linen change; geographical location; emergency and outpatient load; presence or absence of air conditioning in the hospital; quantity of disposable linen items used; and others.

The concentrated loads and vibrations of some laundry equipment may require special structural design measures to prevent local overloading or vibration of the structure.

SUPPLIES

TYPE

The type of supplies such as detergents, soaps, bleaches, and sours will be dependent on the pH (degree of acidity or alkalinity) of the water, the nature and degree of soil in the linen, temperature of the water, and many factors that might affect the processing of the linen. Initial tests should be made to determine the best supplies and the correct amounts to be used to meet local conditions before a definite formula is adopted. From time to time, formula change may have to be made to coincide with seasonal differences that may affect the quality of the water supply or to meet other conditions that arise if the best laundry results are to be obtained.

In procuring linen for hospital use the purchasing agent should consider the durability, cost of laundering, and purchase price. He should make certain the linen has a firm, close, and uniform weave; straight and unbroken lengthwise and crosswise threads; a neat tidy tape salvage with extra woven threads; equal hems on each end of the sheets, encouraging equal distribution of wear by not designating a head and foot; minimum shrinkage; and tendency to lint. If any colored linen is purchased, it should always be of a fast color.

Extra precut covers and padding for ironers and presses should be kept on hand to reduce downtime when these items need to be changed.

recommended that consideration be given to purchase of asbestos or nylon covers and pads for ironers and presses because they last longer.

No equipment should be purchased before it is related to the type, size, and desired results of the linen load to be processed. Consideration should be given to the availability of maintenance because the hospital maintenance staff cannot always make the necessary repairs to modern heavy-laundry equipment.

STORAGE AND ISSUE

Drum cradles should be provided for sizeable containers of liquid or dry washing compounds. Other supplies should be stored on shelves.

It is better to have the bulk of the supplies stored in the hospital's general storeroom and issued by requisition on a weekly basis or in the same manner and schedule that supplies are issued to other departments of the hospital.

PROCUREMENT OF SUPPLIES AND EQUIPMENT

The supplies and equipment purchased by the hospital purchasing agent should be based upon technical specifications developed with cooperation and assistance of the laundry manager. In making these purchases the purchasing agent should realize that price is not always the deciding factor.

The laundry manager should be familiar with the action and effect of soaps, detergents, sours,

bleaches, and disinfectants for the conditions under which he operates. The most reliable test for any laundry supply is its use under actual laundry conditions. The hospital laboratory or outside assistance may be called upon to help in evaluating the efficiency of various supplies. Such assistance is particularly important when selecting bacteriostatic conditioning agents if they are to be used.

ARCHITECTURAL ASPECTS

DESIGN FOR ASEPSIS

The question of the effectiveness of the laundry process in removing bacterial contamination from linens has been a matter of concern for some years. Arnold's⁶ study of commercial laundry practices in the removal of bacteria from soiled linens in 1938 was a forerunner of many other related studies which have increased our knowledge of the subject. Among these other studies is that by Church and Loosli⁷ which was outstanding in its revelation of the hazard of recontamination of cleaned linens by the environment in the laundry processing area.

Church and Loosli showed that enormous numbers of bacteria were thrown into the air of the processing area when linen was sorted in this area before it was washed. This airborne contamination pervaded the environment in varying degrees and was eventually redeposited on the clean washed materials during the extracting process, when they were hung in the laundry, and when they were

folded before they were delivered back to the wards.

As a result of this and similar most recent studies,⁸ it is the generally accepted practice in laundry design to isolate the sorting procedure in a separate room. This separation will materially reduce the amount of bacterial contamination which would otherwise be distributed through the processing area. However, this separation still requires the movement of the sorted soiled linen to the washers in the processing area with some possibility of dissemination of bacteria into the air when the linens are loaded into the washers, but with careful handling of this operation the contamination from this source should be minimal.

The adoption of the recently developed double-door pass-through washer-extractor provides another means of controlling this spread of contamination. The adaption of this unit to the separate sorting room concept would appear to provide the ultimate in separation of the clean

and the contaminated processes. This washer-extractor is constructed for installation in a wall between the contaminated and clean operations with the equipment and loading door of the washer-extractor located in the contaminated area and the unloading door located on the opposite side of the wall in the clean area.

The workflow diagram shown in figure 2 and layouts in figures 3 and 4 incorporate design concept and are offered as illustrations of the recommended application.

Other methods are the single-door washer-extractor system shown in figure 5 and the mez-

zanine sorting and overhead hopper loading system shown in figure 6, which is usually used in hospitals larger than those considered in this publication. The single-door washer and separate extractor, and more recently a single-door combination washer-extractor, have been and are being used successfully in hospitals. However, the use of this type of equipment in the same room with the clean linen processing is contrary to the emerging concept of complete separation of clean and soiled functions throughout the hospital and may require additional training and administrative supervision to minimize the possibility of recontamination of the finished product by airborne micro-organisms.

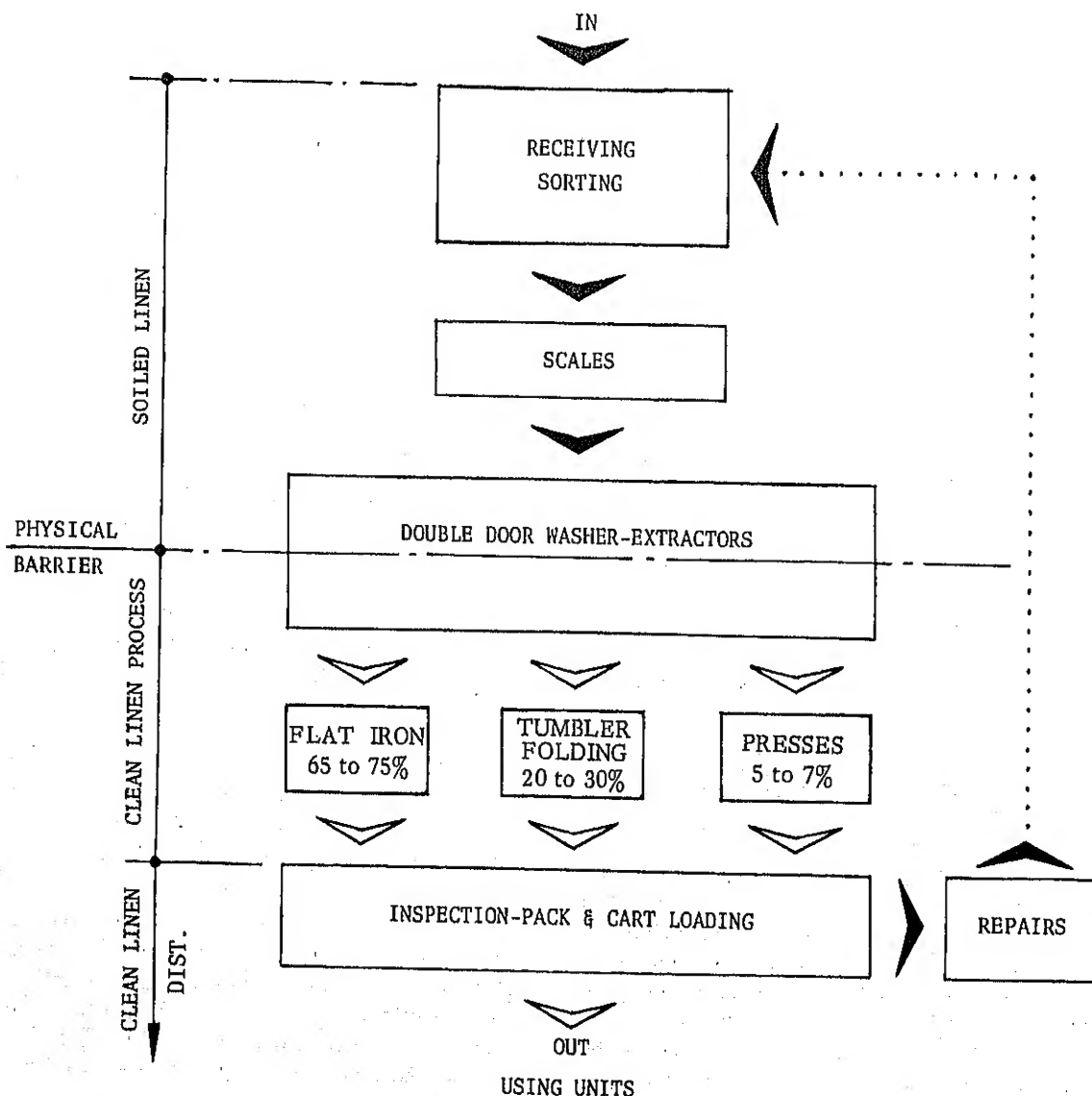
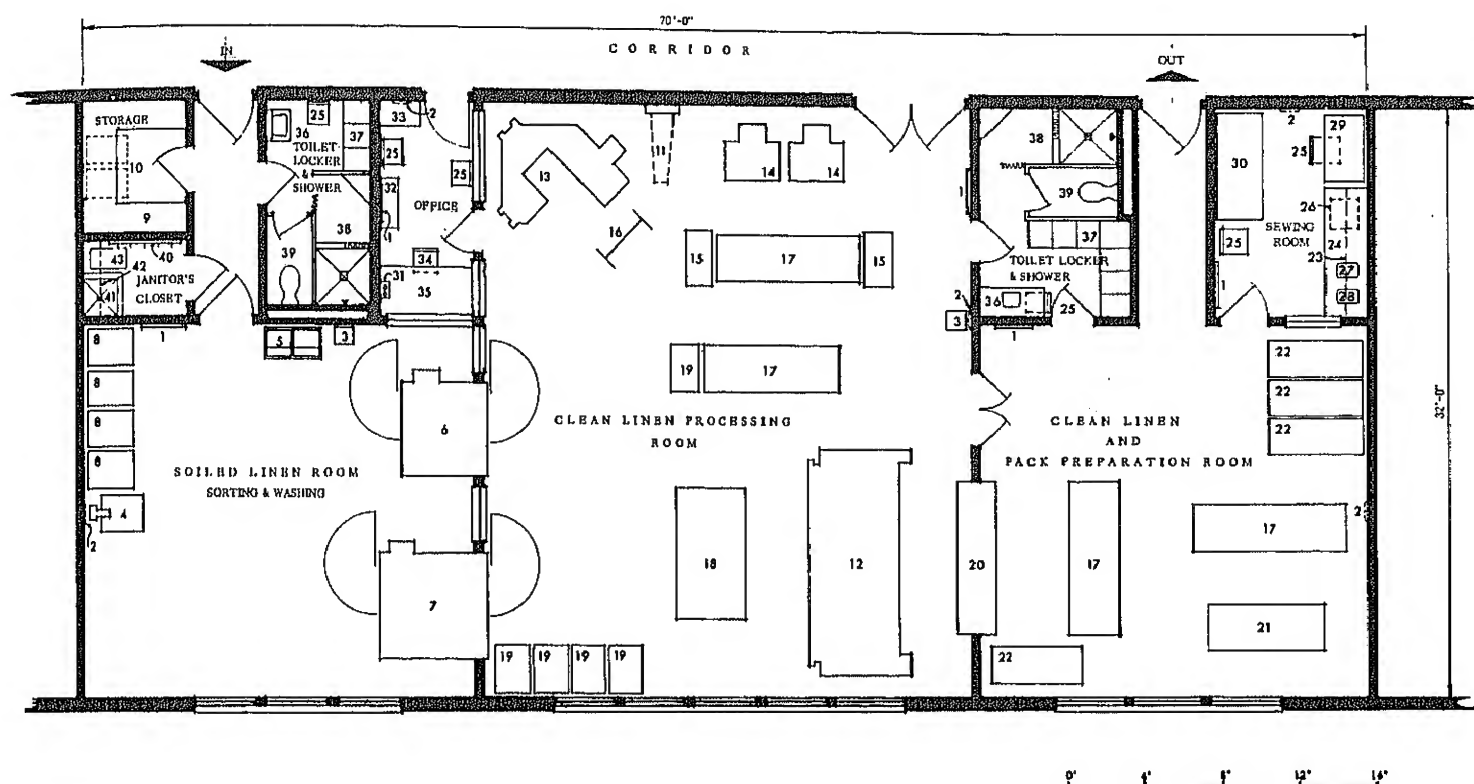


Figure 2.—Workflow diagram for processing hospital linen showing the various positions or functions through which the soiled linen must pass when the double-door washer-extractor technique is used.



LEGEND

- | | |
|--|---|
| 1. Board, bulletin, 26 x 24 inches | 23. Cabinet, wall |
| 2. Clock, electric | 24. Counter, 36 inches high, open below |
| 3. Fountain, drinking | 25. Chair, straight |
| 4. Scales, platform, flush with floor | 26. Hamper, linen |
| 5. Tub, laundry, two compartments | 27. Machine, washing, floor |
| 6. Washer-extractor, double-door, capacity 130 pounds | |
| 7. Washer-extractor, double-door, capacity 200 pounds | |
| 8. Truck, soiled linen | |
| 9. Shelves | |
| 10. Cradle, drum | |
| 11. Board ironing, wall hung | |
| 12. Ironer, flatwork with ventilating canopy, 2-roll, 120 inches | |
| 13. Press | |
| 14. Tumbler, drying, capacity 50 pounds | |
| 15. Cart, wire, adjustable shelves | |
| 16. Rack, garment | |
| 17. Table, locking casters, 30 x 96 inches | |
| 18. Table, locking casters, shake-out with sloping sides, 48 x 84 inches | |
| 19. Truck, clean linen | |
| 20. Counter, pass-through | |
| 21. Table, locking casters, linen inspection, transilluminated, 36 x 72 inches | |
| 22. Cart, clean linen, enclosed, adjustable shelves and partitions | |
| | 34. Chair, office, with arms, seat, and back cushions |
| | 35. Desk, office, double pedestal |
| | 36. Lavatory, blade handles |
| | 37. Locker, clothes, steel, 15 x 18 x 60 inches |
| | 38. Shower and dressing compartment with curtain rods |
| | 39. Water closet |
| | 40. Holder, mop handle |
| | 41. Receptor, floor |
| | 42. Shelf, supply |
| | 43. Truck, mopping, 2 buckets with wringer |

Figure 3.—Laundry for a 75-bed hospital.

LEGEND

1. Board, bulletin, 26 x 24 inches
2. Clock, electric
3. Fountain, drinking
4. Scales, platform, flush with floor
5. Tub, laundry, two compartments
6. Washer-extractor, double-door, capacity 130 pounds
7. Washer-extractor, double-door, capacity 400 pounds
8. Truck, soiled linen
9. Shelves
10. Cradle, drum
11. Board, ironing, wall hung
12. Folder, linen 120 inches
13. Ironer, flatwork with ventilating canopy, 6-roll, 120 inches
14. Press
15. Tumbler, drying, capacity 50 pounds
16. Tumbler, drying, capacity 100 pounds
17. Cart, wire, adjustable shelves
18. Rack, garment
19. Table, locking casters, 30 x 96 inches
20. Table, locking casters, shake-out with sloping sides, 48 x 84 inches
21. Truck, clean linen
22. Counter, pass-through
23. Table, locking casters, linen inspection transilluminated, 36 x 72 inches
24. Cart, clean linen, enclosed, adjustable shelves and partitions
25. Cabinet, wall
26. Counter, 36 inches high, open below
27. Chair, straight
28. Hamper, linen
29. Machine, marking, linen
30. Machine, patching, thermo-type
31. Machine, sewing, electric
32. Table, work, locking casters, 30 x 72 inches
33. Pneumatic tube station
34. Bookcase
35. Cabinet, filing, letter size, 5-drawer
36. Chair, office, with arms, seat, and back cushions
37. Desk, office, double pedestal
38. Lavatory, blade handles
39. Locker, clothes, steel, 15 x 18 x 60 inches
40. Shower and dressing compartment with curtain rods
41. Water closet
42. Holder, mop handle
43. Receptor, floor
44. Shelf, supply
45. Truck, mopping, 2 buckets with wringer

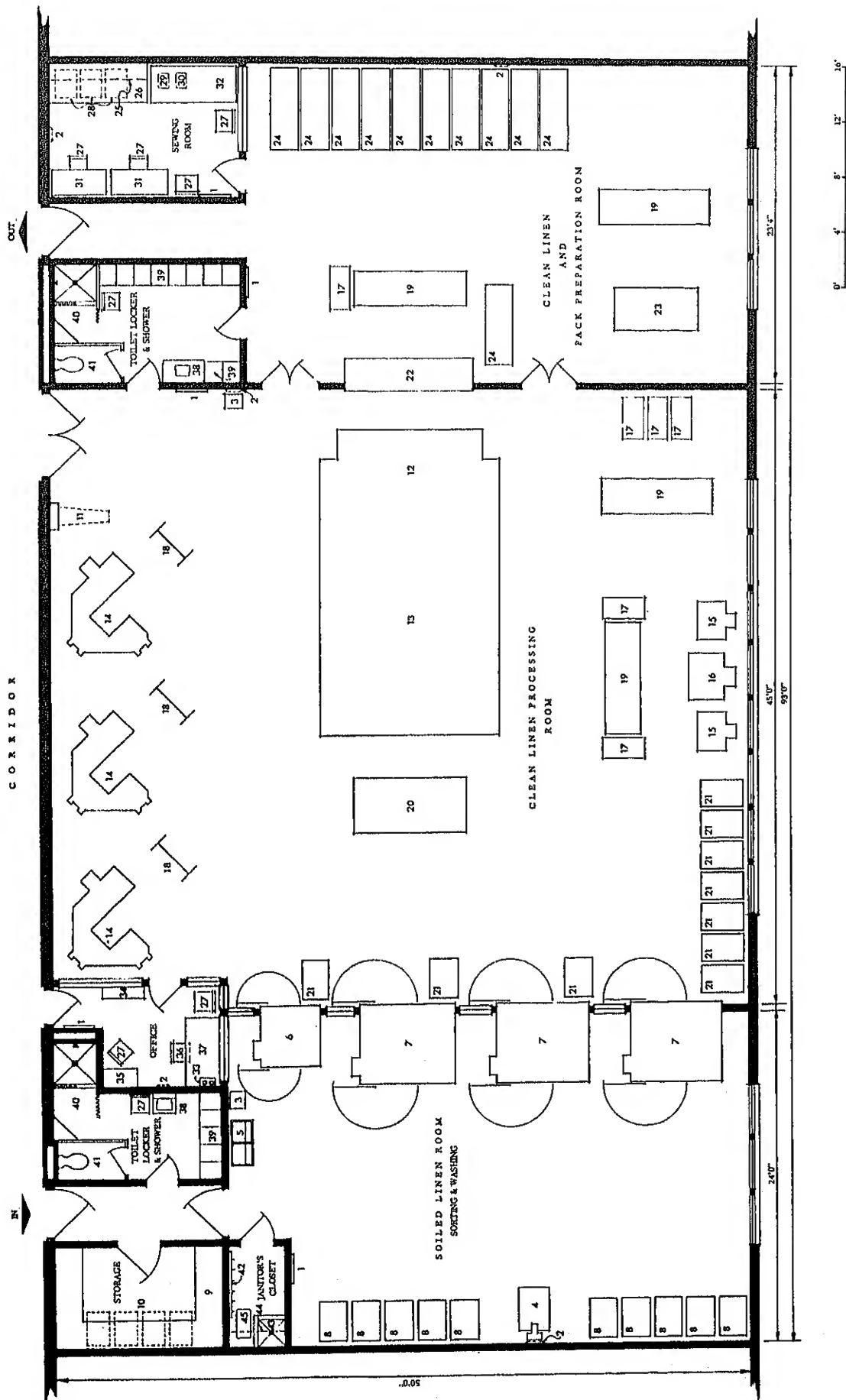
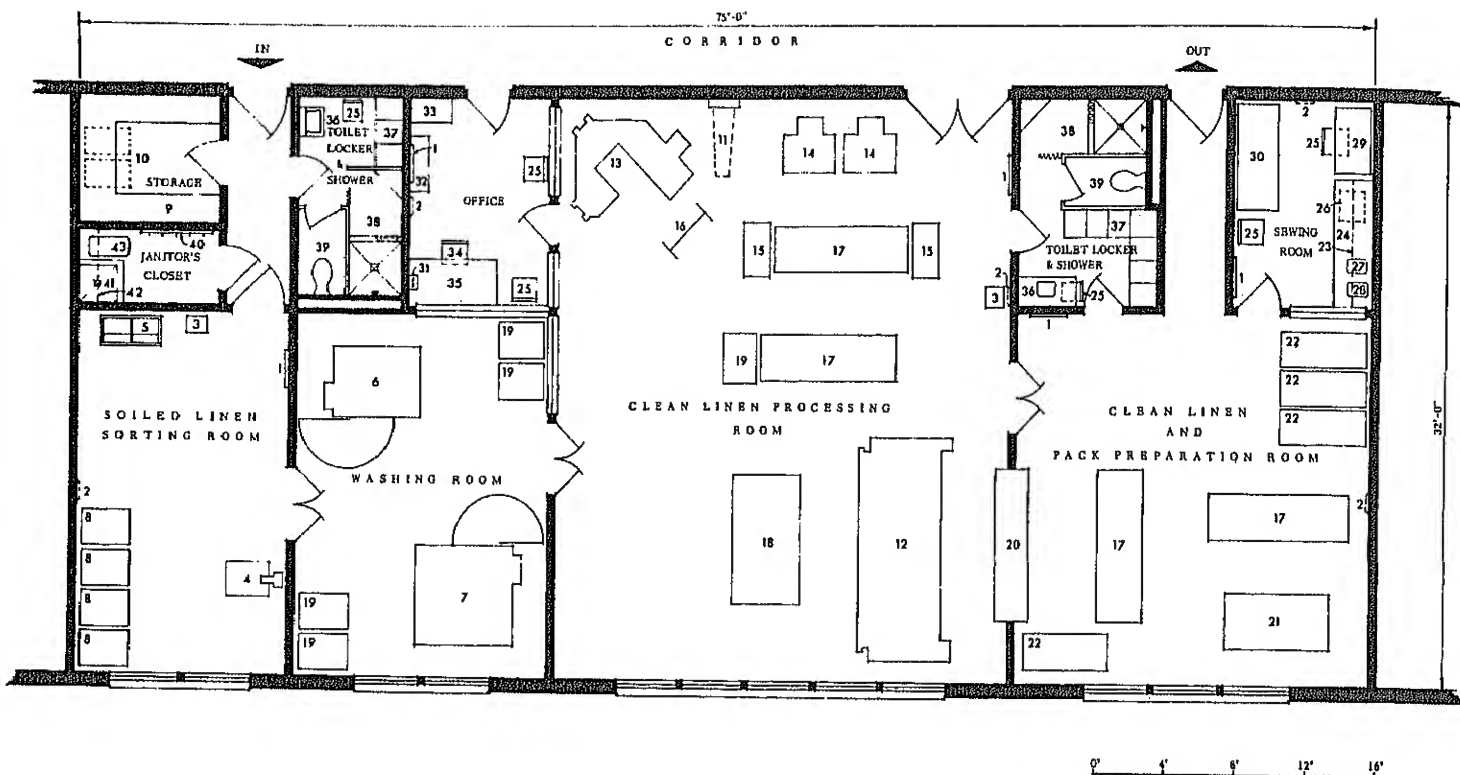


Figure 4.—Laundry for a 200- to 300-bed hospital.



LEGEND

- | | |
|--|---|
| 1. Board, bulletin, 26 x 24 inches | 23. Cabinet, wall |
| 2. Clock, electric | 24. Counter, 36 inches high, open below |
| 3. Fountain, drinking | 25. Chair, straight |
| 4. Scales, platform, flush with floor | 26. Hamper, linen |
| 5. Tub, laundry, two compartments | 27. Machine, marking, linen |
| 6. Washer-extractor, single-door, capacity 130 pounds | 28. Machine, patching, thermo-type |
| 7. Washer-extractor, single-door, capacity 200 pounds | 29. Machine, sewing, electric |
| 8. Truck, soiled linen | 30. Table, work, locking casters, 30 x 72 inches |
| 9. Shelves | 31. Pneumatic tube station |
| 10. Cradle, drum | 32. Bookcase |
| 11. Board, ironing, wall hung | 33. Cabinet, filing, letter size, 5-drawer |
| 12. Ironer, flatwork with ventilating canopy, 2-roll, 120 inches | 34. Chair, office, with arms, seat, and back cushions |
| 13. Press | 35. Desk, office, double pedestal |
| 14. Tumbler, drying, capacity 50 pounds | 36. Lavatory, blade handles |
| 15. Cart, wire, adjustable shelves | 37. Locker, clothes, steel, 15 x 18 x 60 inches |
| 16. Cabinet, wall | 38. Shower and dressing compartment with curtain rods |
| 17. Counter, 36 inches high, open below | 39. Water closet |
| 18. Chair, straight | 40. Holder, mop handle |
| 19. Hamper, linen | 41. Receptor, floor |
| 20. Machine, marking, linen | 42. Shelf, supply |
| 21. Machine, patching, thermo-type | 43. Truck, mopping, 2 buckets with wringer |
| 22. Machine, sewing, electric | |
| 23. Table, work, locking casters, 30 x 72 inches | |
| 24. Pneumatic tube station | |
| 25. Bookcase | |
| 26. Cabinet, filing, letter size, 5-drawer | |
| 27. Chair, office, with arms, seat, and back cushions | |
| 28. Desk, office, double pedestal | |
| 29. Lavatory, blade handles | |
| 30. Locker, clothes, steel, 15 x 18 x 60 inches | |
| 31. Shower and dressing compartment with curtain rods | |
| 32. Water closet | |
| 33. Holder, mop handle | |
| 34. Receptor, floor | |
| 35. Shelf, supply | |
| 36. Truck, mopping, 2 buckets with wringer | |

Figure 5.—Single-door washer-extractor system.

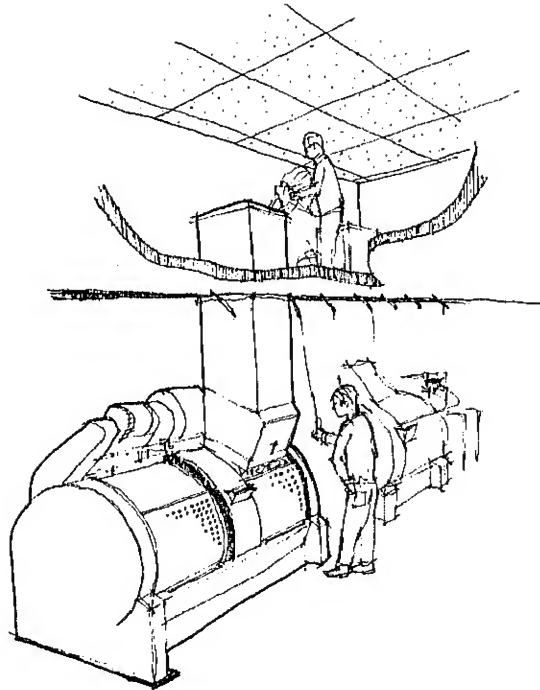


Figure 6.—Mezzanine sorting overhead hopper loading system.

PHYSICAL PLANT

The physical planning of the hospital laundry includes several major items of design which must be considered to produce a low cost efficient operation. These considerations are: location of the laundry, techniques employed, space requirements, construction materials, and decor.

Location of Laundry

Whether the laundry is in the main building of the hospital, in a separate building, or with one or more of the hospital's operational services, it should be located convenient to the using units. The soiled linen receiving and clean linen distribution rooms should always be physically separated with separate entrances.

Wherever the laundry is located, the route of the soiled linen from the using units to the laundry and the clean linen from the laundry to the using units should be planned to minimize the possibility of contamination of clean linen, loss of linen, and personnel frustration. The transportation of clean linen through unclean areas will nullify the efforts by the laundry personnel to produce clean linen.

Several techniques are employed in achieving a satisfactory result from the standpoint of economy and the finished laundry product. A specified method of operation should first be selected and this technique will then determine the correct amount of space, personnel, and equipment required to assure balanced production and work areas in the laundry.

Once the method of operation is decided upon, the size and kinds of equipment based on work volume can be selected. The physical space and layout can then be designed.

The arrangement of the equipment and related areas should result in a straight workflow so that criss-crossing and backtracking from one operation to the other can be avoided. This is a major factor in lowering operational costs and promoting an efficient operation by conserving labor and permitting a shift of workers to change from one type of work to another without unnecessary travel.

For full utilization of this area, it should be free of columns and obstructions and future expansion should be considered.

The laundry facility shall comply with all National and local codes covering the planning and construction of such facilities.

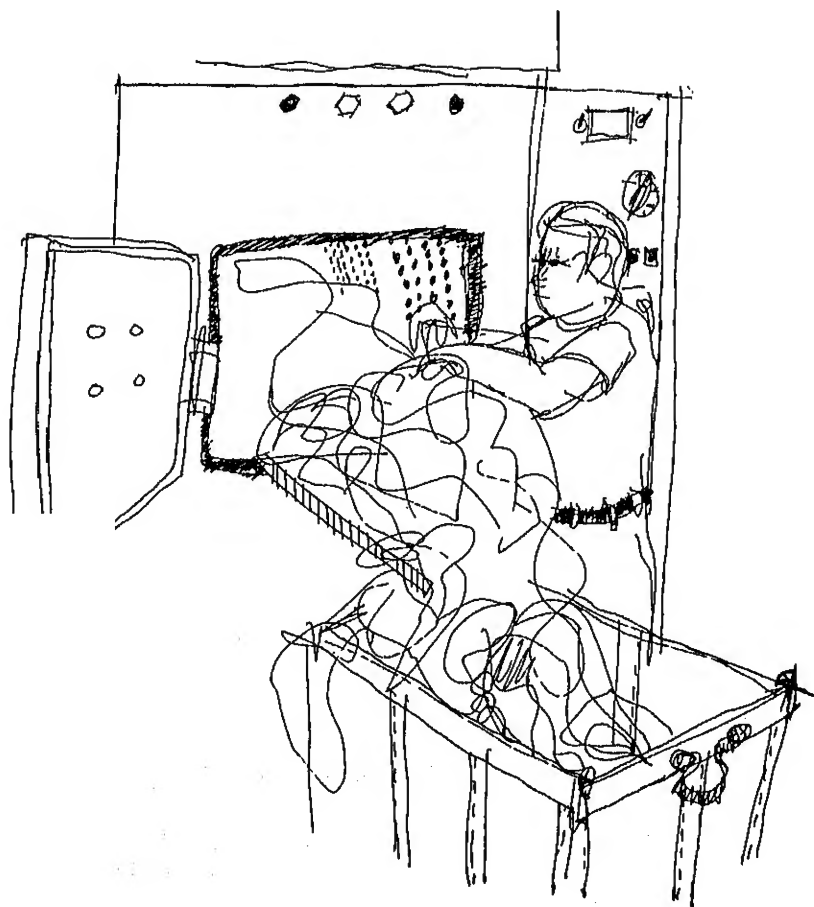
The laundry should be divided into separate and specific areas such as: soiled linen receiving, sorting, and washer loading; clean linen processing; clean linen disbursing; office; supply storage; and toilets. (See figures 1 and 2.) The workload and workflow of each area should be a major consideration in good laundry planning.

Technique and Space Requirements

Soiled linen receiving, sorting, and washer loading room.-- This room should be separated from the other areas of the laundry by walls with hermetically sealed vision panels, floors, and ceilings having a fire resistance rating of not less than one hour. Openings to this room should be protected by approved Class B, one-hour fire doors. Soiled linen from all using units is transported to this room via chutes, mechanical or pneumatic conveyors, carts, or trucks. If the

prewash sorting system is used, the soiled linen, except that identified as having been in contact with a patient diagnosed or suspected of having a communicable disease, is sorted and classified according to source, type, degree of soil, and washing formula to be used. Trucks or movable bins, lightweight and easily cleaned, should be used in the soiled linen sorting room. These trucks should not be used for clean linen transportation and should be cleaned at the end of each day. After sorting and classification, the linen should be weighed and the weight of each linen load, minus the weight of the transportation vehicle, should be recorded. A platform scale flush with the floor is preferable for this activity.

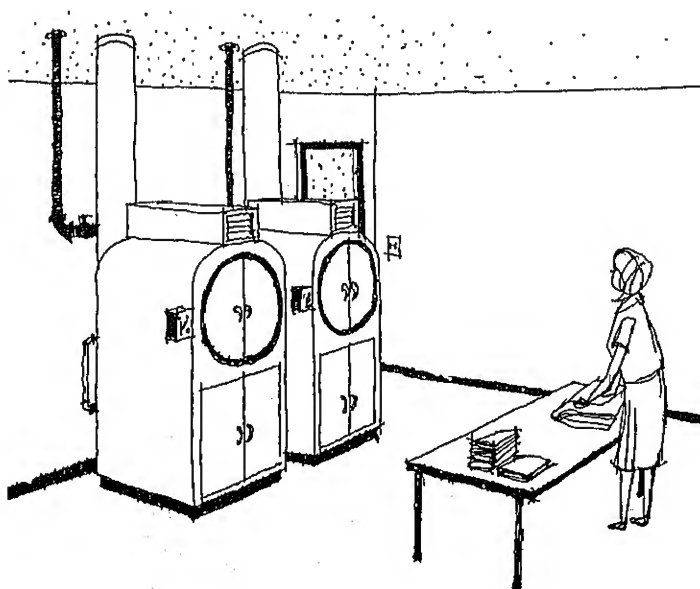
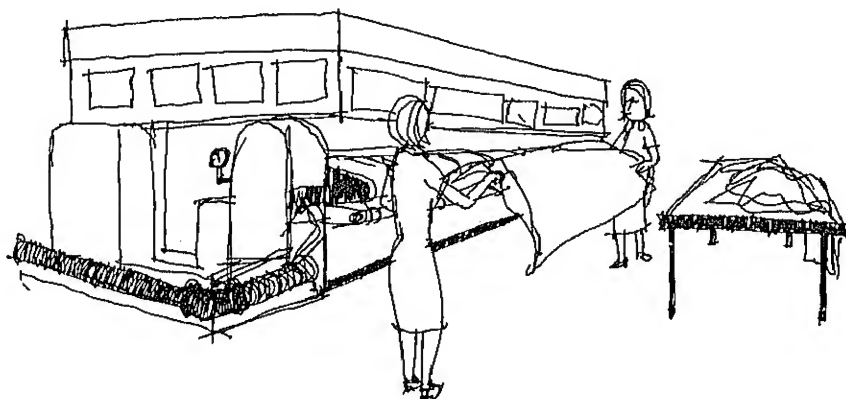
The double-door washer-extractor is loaded with as nearly as possible the same classification of linen, such as flatwork, tumbler, and presswork because different washing formulas may be required for each load. The washer-extractor should be regulated to produce linen with not more than 50 percent moisture retention.



Clean linen processing room.--After the required cycle has been completed, the linen in the washer-extractor is emptied into laundry trucks in the clean linen processing room.

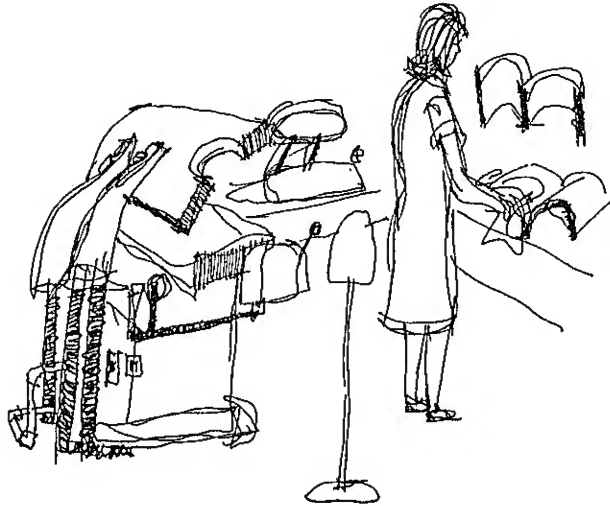
The clean linen should be put into light weight, easily cleaned linen trucks or on conveyors. From

This area should be large enough to receive and hold all necessary equipment and accessories incidental to the laundry technique or procedure used. There should be ample space on all sides of each piece of equipment to allow for the passage of personnel and mobile equipment and for ease of maintenance.



this point, the linen is transferred to the ironer, the tumbler, or to the presses, according to the finishing process to be done. Flatwork such as sheets and pillow cases is sent to the ironer; fluff dry such as bath towels is sent to the tumbler; and presswork such as uniforms is sent to the presses.

Linen carts, trucks, or conveyors may be used for the transportation of finished linen from the tumblers and the presses to the clean linen and pack preparation room.

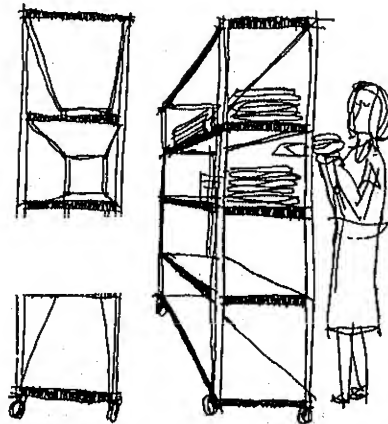


Clean linen and pack preparation room.--
After the linen has been processed, it is assembled in a clean linen room and arranged for issue according to the distribution system used.

If the preparation of any linen packs to be sterilized is the responsibility of the linen service, the linen should be inspected over a transilluminated inspection table and the packs prepared in

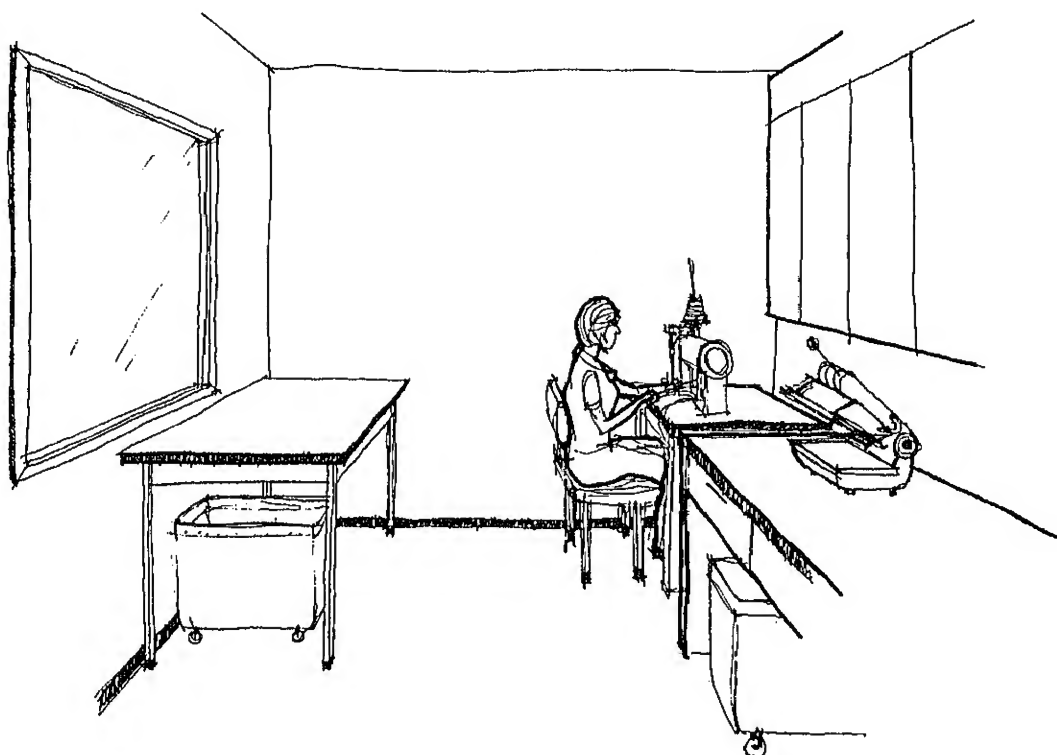
this room or in a separate room assigned specifically for this activity.

This area should be the only way out for the finished product and should be adjacent and readily accessible to the entire clean linen processing area. It should also be directly adjacent to the flatwork ironer because the flatwork is the bulk of the workload.



Sewing room.--Linen repairing or manufacturing of such items as wrappers, surgical or obstetrical drapes, and other special linen items should be done in this room. A cabinet should be provided for materials and repair supplies. Space under the counter may be used for temporary storage of unrepaired linen.

Toilet, locker, and shower facilities.--Toilet, locker, and shower facilities should be provided in the soiled linen receiving, sorting, and washer loading room, and the clean linen processing room. In smaller hospitals it may be more practical for personnel working in the clean linen processing room to use nearby facilities.



The sewing room should be located contiguous to the clean linen and pack preparation room. It should be large enough to accommodate the necessary equipment such as sewing and mending machines, tables, linen hampers, linen repair supplies, and any other items required for the upkeep of the hospital linen.

Laundry manager's office.--This office should be located as centrally as possible so that the manager may properly supervise the entire laundry operation. The walls should include large vision panels to allow for full view of each area. A two-way communication system is required between this office and each laundry area, particularly the isolated soiled linen area.

Supply storage room.--The supply storage room should be adjacent and connected to the soiled linen receiving, sorting, and washer-loading room. Ample space should be provided for the storage of one week's supply of detergents, bleaches, and sours. Bulk items should be stored in the general storeroom.

Materials and Decor

The construction materials for all rooms or areas of the laundry should be as follows: the floor should have a smooth, slip resistant, water-proof surface; the walls should have a smooth washable surface, free from all unnecessary corners, edges, or projections which could become

a maintenance problem to clean; and the ceiling should be a smooth, washable surface and high enough to allow for the installation and repair of all equipment, with a minimum height of 11 feet. This height will provide sufficient clearance for the installation of conveyors or other ceiling mounted

equipment. All piping and ductwork should be concealed.

The color scheme of all areas should be light and cheerful to aid the general morale of personnel and contribute to good lighting characteristics.

MECHANICAL CONSIDERATIONS

All utility services including piping and electrical wiring should be designed and sized with proper consideration for future expansion of the laundry. Alterations or replacement of the systems at a later date to increase their capacity to serve additional or larger equipment will be costly and cause major disruption of service.

The various piped utility systems serving the hospital should be appropriately identified by color and symbol coding, and this identification should be carried out in the laundry. This identification not only acts as a safety measure but will also expedite repairs.

STEAM

The importance of proper design of the process steam system for the laundry cannot be too strongly emphasized. For efficient operation of the laundry equipment, the steam supply system must deliver steam to the equipment in the quantities and at the temperatures required, and the return piping system must expedite the removal of condensate from the equipment. The maximum steam demand must be predicated upon the simultaneous use of the various types and sizes of equipment with proper consideration for future expansion of the laundry to include additional equipment.

The principle uses for steam will be in the operation of presses, tumblers, and flatwork ironers. Here the temperature of the steam becomes a critical factor affecting both the economy of operation and the quality of the finished product. This is of particular significance in the operation of the flatwork ironer and presses which perform the dual role of ironing and of drying the linens. Too low a temperature in flatwork ironer chests will result in surface friction with sticking of the materials to rolls and insufficient drying which requires a second pass through the ironer. Too high a temperature results in a breakdown of the

textiles used for padding the rolls, and also reduces tensile strength and life of the processed linen. A temperature of 338°F. obtained from steam at 100 pounds per-square-inch pressure should be the minimum temperature delivered to the equipment. A temperature of 353°F. obtained from steam at 125 pounds per-square-inch pressure should be the maximum temperature delivered to the equipment. As a byproduct of the processing, these temperatures have the added advantage of reducing any existing bacterial contamination on the materials.

All steam lines should be properly insulated for protection of personnel, economy of operation, and reduction of the heat load of the environment.

WATER

The design of the water distribution system to ensure an adequate supply at the equipment throughout the day is of extreme importance for an efficient processing procedure. The system's pressure and the demand upon the hot water system by the many hospital departments at various times of the day must be taken into account in sizing water heaters, distribution piping, and hot water storage facilities. Approximately three gallons of hot water and one gallon of cold water will be required per pound of linen processed.

The hot water supply may be piped to the laundry at the temperature required directly from the boiler room; it may also be piped at a lower temperature and raised to the final required temperature in the laundry by means of indirect water heaters served by steam piped from the boiler room. The use of direct-fired heaters within the laundry is not recommended.

Hot water should be available at a temperature of approximately 180°F. with accurate control devices to ensure the proper water tempera-

tures required for the various processes. If experience data is not available, an analysis of the characteristics of the local water supply should be obtained to determine whether water softening is needed. The upper limit of acceptable water is considered to be 3 to 4 grains of hardness. In most areas of the United States some water treatment will be required. Hardness, particularly as reflected by calcium and magnesium, will result in excessive use of washing compounds and in an inferior laundry product as the result of a gummy precipitate caused by calcium and magnesium uniting with the washing compound.

Hot water lines and indirect heaters, where used, should be carefully insulated for protection of personnel, economy of operation, and reduction of the heat load of the environment. Cold water lines should be insulated to maintain temperature and to reduce condensation and dripping in the area.

COMPRESSED AIR

Compressed air will be required for the operation of equipment such as presses and may be utilized for cleaning exhaust duct systems and for control of the heating and ventilating equipment.

In most instances because compressed air is used for other purposes throughout the hospital, a central compressed air system may be installed which will also serve the laundry. If a separate compressed air system is installed, the compressor should not be installed in the laundry processing area. The compressor should be equipped with air dryers, oil separators, and condensers.

PLUMBING

The lavatories in toilet facilities should be equipped with blade handles.

The separation of the washing process area from the drying, pressing, and ironing process area limits the need for floor drains to the sorting and washing area. The trench drain under the washers will, in most instances, suffice for wet cleanup of this area. The trench and drain sump should be sized to accommodate the quick drainage of the washers with proper consideration for possible future expansion which may require an additional washer. To extend the drainage trench

at a future date may be very costly. The drain should be equipped with proper sediment and lint trap.

VENTILATION

The ventilation system must serve a twofold function. First, it must provide a comfortable year-round environment for personnel. In many geographical areas this will require cooling of the air during the summer season and heating in winter. Second, it must provide safety for personnel and contribute to the quality of the finished product by the removal of airborne contamination.

A well-designed ventilation system will provide personnel comfort, which will contribute to the efficiency of operation and reduction in personnel turnover with its attendant costs. Separate mechanically operated supply and exhaust systems are required. The outdoor air supply intake should be as far removed as possible from any exhaust outlets, incinerators, and boiler stacks. The outdoor air exhaust outlets should also be carefully located so that their effluent will not reenter the laundry or other hospital areas or create an annoyance. Under certain circumstances it may be desirable to filter the air being exhausted from the soiled linen sorting room. The air supply system should be equipped with filters with an efficiency of 80% according to the National Bureau of Standards' Dust Spot Test Method on atmospheric dust. A manometer should be installed across each filter bed to indicate the need for filter cleaning or replacement.

The ventilation supply and exhaust fans serving each area should be electrically interlocked so that failure of either will stop the other.

The washers, flatwork ironers, presses, and tumblers will be the principle sources of heat and humidity. However, if large glazed areas are used in exterior walls, the effects of solar heat should not be overlooked.

The capture and removal of heat at its source will best be effected by the use of a canopy over the flatwork ironer and by locating the other exhaust air outlets in the vicinity of the washers, presses, and tumblers.

The location of air supply inlets and exhaust air outlets must be carefully planned to secure a

suitable air movement pattern through the processing areas. The air supply inlets should be located so as to provide a movement of fresh air toward the heat producing equipment for exhaust where this equipment is located.

Exhaust ductwork should be fabricated with cleanout openings at approximately 20-foot intervals to facilitate removal of lint and other particulates. Glazed cleanout openings will permit visual inspection of the ductwork which will eliminate the necessity of opening the systems to observe their condition. Lint filters will be required on the tumbler exhaust system in addition to the filters supplied with the equipment, and this type of filter should be considered for all exhaust systems.

The ventilation rates for the processing area will, in most instances, be determined by the quantity of air required to remove the heat and humidity produced by the equipment in these areas. However, under no circumstances should the ventilation rate of these areas be less than 10 air changes per hour.

The ventilation system should be designed to provide air pressures in the various areas in a descending order from the clean areas to the more contaminated areas.

The soiled linen sorting room will require a minimum of 10 air changes per hour to remove the airborne bacteriological contamination that comes from linen handling. This room, being highly contaminated, should be maintained at a negative air pressure relative to any adjoining areas which open into it. Air from the linen processing rooms may be used as makeup ventilation air for this room.

The clean linen processing room, if adjoining but not a part of the washroom, should be maintained at a positive air pressure relative to the air pressure of the washroom.

The office, sewing, and clean linen rooms should be ventilated at a rate of 4 air changes per hour. These rooms should be maintained at a positive air pressure relative to the air pressure of the linen processing areas to reduce to a minimum the infiltration of warmer air from the processing areas.

The locker rooms and toilets should be ventilated at a rate of 10 air changes per hour. These rooms should be maintained at a negative air pressure.

ELECTRICAL SERVICE

POWER SUPPLY

The power supply to the laundry is usually 120/208 volts, 3-phase, 4-wire alternating current. The distribution panel must be readily accessible, preferably located near the load center, away from the direct path of escaping steam or vapor.

Receptacles (convenience outlets) should be installed where required not more than 20 feet apart around the periphery of the room, mounted approximately 4 feet above the floor, and/or where they are convenient for specific uses.

If it is necessary to make a preliminary estimate of power requirements for determining feeder sizes, the following values are suggested:

For operation of motorized equipment: 3 KWHR per 100 pounds of dry laundry.⁹

For lighting: 3.0 watts per square foot of floor space.

LIGHTING

Lighting in the laundry should be relatively free of glare and shadows. Reflectance values should range from approximately 75 to 80 percent for walls and ceilings and from 20 to 40 percent for floors as an aid to lighting.

Daylight should be used where possible. The report on a research study of effect of reflected glare from sidewall fenestration on various tasks, by the Illuminating Engineering Society,¹⁰ shows that distinct advantages accrue by supplementing the electric lighting with daylight.

The lighting levels recommended for the laundry are:

| <u>Area</u> | <u>Footcandles on task at any time</u> |
|--|--|
| Soiled linen room | 50 |
| Clean linen processing room | 100 |
| Sewing room | 100 |
| Clean linen and pack preparation room | 100 |
| Office | 100 |
| Toilets | 30 |
| Storage | 20 |

| <u>Area</u> | <u>Footcandles on task at any time</u> |
|-------------|--|
| Passageways | 20 |

COMMUNICATIONS

A two-way audio communication system between the laundry manager's office and all the areas of the laundry, and between the separated soiled linen room and the clean linen processing room is desirable.

FIRE SAFETY FACTORS

All surfaces that may collect lint, including fan blades, ducts, and lint collectors, should be cleaned frequently to reduce potential fire hazards.

All collected lint and trash should be disposed of regularly to further reduce potential fire hazards.

Fire extinguishers should be located throughout the laundry. Class A type fire extinguishers should be placed convenient to soiled and clean linen holding areas as well as convenient to proc-

essing areas. Class C type fire extinguishers should be placed convenient to the location of electrical components.

A sprinkler system should be installed in the soiled linen room, and if linen chutes are used, sprinklers should be installed at the top and alternate floors.

Exitways should be plainly marked and clear of obstructions.

PLANT MAINTENANCE

Good maintenance does not just happen; it is planned. The earlier it is planned, the easier it should be to accomplish. If the equipment layout provides access for maintenance and the quality of the equipment is assured by a well-written specification, maintenance is off to a good start. However, regardless of the layout and the equipment installed, maintenance can be made easier

COST OF OI

To accurately determine the cost of the laundry operation, a detailed record should be maintained of all activities required for soiled linen collection, processing, pack preparation, linen manufacture and repair, and distribution. The cost finding system adopted should have a complete breakdown of each of these activities to re-

indirectly associated with the activity should be included. The following breakdown, which should be adjusted to meet local operations, may be used as a guide:

Laundry

Salaries and wages
Employee fringe benefits
Health and welfare fund
Subsistence
Uniforms
Uniform laundering
Plant operation
Utilities
Communication
Heat
Power and light
Steam
Water
Maintenance of equipment
Equipment repair and parts

Depreciation

Equipment
Building
Supplies
Laundry
Office

Housekeeping

Salaries and wages
Employee fringe benefits
Health and welfare fund
Subsistence
Uniforms
Uniform laundering

Administration

Salaries and wages
Employee fringe benefits
Health and welfare fund
Subsistence

SUGGESTED EQUIPMENT LIST

| | 75 Beds | 100-175 Beds | 200-300 Beds | | 75 Beds | 100-175 Beds | 200-300 Beds |
|---|------------|-----------------|-----------------|--|------------|-----------------|-----------------|
| SOILED LINEN RECEIVING, SORTING, AND WASHER LOADING ROOM | 1 | 1 | 1 | Light above lavatory | 1 | 1 | 1 |
| <u>Fixed Equipment</u> | | | | Locker, clothes, steel, 15 x 18 x 60 inches | 3 | 4 | 5 |
| Board, bulletin, 26 x 24 inches | 1 | 1 | 1 | Mirror above lavatory | 1 | 1 | 1 |
| Clock, electric | 1 | 1 | 1 | Receptacle | | | |
| Fountain, drinking | 1 | 1 | 1 | Soap | 1 | 1 | 1 |
| Scales, platform, flush with floor . . . | 1 | 1 | 1 | Waste, wall recessed | 1 | 1 | 1 |
| Tub, laundry, two compartments | 1 | 1 | 1 | Seat, built-in, dressing compartment . . | 1 | 1 | 1 |
| Washer-extractor, double-door, automatic formula dispenser* | | | | Shelf above lavatory | 1 | 1 | 1 |
| Capacity 130 pounds | 1 | 1 | 1 | Shower and dressing compartment with curtain rods | 1 | 1 | 1 |
| Capacity 200 pounds | 1 | 1 | - | Water closet | 1 | 1 | 1 |
| Capacity 400 pounds | - | 1 | 3 | <u>Movable--Major Depreciable Equipment</u> | | | |
| <u>Movable--Major Depreciable Equipment</u> | | | | Chair, straight | 1 | 1 | 1 |
| Truck, soiled linen | 4 | 5 | 8 | OFFICE | - | 1 | 1 |
| SUPPLY STORAGE ROOM | 1 | 1 | 1 | <u>Fixed Equipment</u> | | | |
| <u>Fixed Equipment</u> | | | | Board, bulletin, 26 x 24 inches | 1 | 1 | 1 |
| Shelves | 4 | 5 | 6 | Clock, electric | 1 | 1 | 1 |
| <u>Movable--Major Depreciable Equipment</u> | | | | Pneumatic tube station | - | 1 | 1 |
| Cart, utility | 1 | 1 | 1 | <u>Movable--Major Depreciable Equipment</u> | | | |
| Cradle, drum | 2 | 2 | 4 | Bookcase | 1 | 1 | 1 |
| Ladder, 2 steps with rails | 1 | 1 | 1 | Cabinet, filing, letter size, 5-drawer | 1 | 1 | 1 |
| JANITOR'S CLOSET | 1 | 1 | 1 | Chair | | | |
| <u>Fixed Equipment</u> | | | | Office, with arms, seat, and back cushion | 1 | 1 | 1 |
| Dispenser | | | | Straight | 2 | 2 | 2 |
| Paper towel | 1 | 1 | 1 | Desk, office, double pedestal | 1 | 1 | 1 |
| Soap | 1 | 1 | 1 | Lamp, desk | 1 | 1 | 1 |
| Holder, mop handle | 1 | 1 | 1 | CLEAN LINEN PROCESSING ROOM . . | 1 | 1 | 1 |
| Receptor, floor | 1 | 1 | 1 | <u>Fixed Equipment</u> | | | |
| Shelf, supply | 1 | 1 | 1 | Board | | | |
| <u>Movable--Major Depreciable Equipment</u> | | | | Bulletin, 26 x 24 inches | 1 | 1 | 1 |
| Truck, mopping, 2 buckets with wringer | 1 | 1 | 1 | Ironing, finishing, wall hung | 1 | 1 | 1 |
| TOILET, LOCKER ROOM, SHOWER | 1 | 1 | 1 | Clock, electric | 1 | 1 | 1 |
| <u>Fixed Equipment</u> | | | | Compressor, air | 1 | 1 | 1 |
| Bar, towel | 1 | 1 | 1 | Folder, linen, 120 inches | - | - | 1 |
| Dispenser | | | | Fountain, drinking | 1 | 1 | 1 |
| Paper towel | 1 | 1 | 1 | Ironer, flatwork with ventilating canopy* | | | |
| Soap | 1 | 1 | 1 | 2-roll, chest type, 120 inches | 1 | - | - |
| Fixture, toilet paper | 1 | 1 | 1 | 4-roll, 120 inches | - | 1 | - |
| Hook, clothes | 2 | 2 | 2 | 6-roll, 120 inches | - | - | 1 |
| Lavatory, blade handles | 1 | 1 | 1 | Press** | | | |
| | | | | Finishing | 2 | 4 | 6 |
| | | | | Utility | 1 | 2 | 3 |
| | | | | Tumbler, drying* | | | |
| | | | | Capacity 50 pounds | 2 | 3 | 2 |
| | | | | Capacity 100 pounds | - | - | 1 |
| | | | | <u>Movable--Major Depreciable Equipment</u> | | | |
| | | | | Cart, wire, adjustable shelves | 2 | 4 | 6 |

* Type and capacity may vary according to local requirements and preference.

** Needed if uniforms are processed. Adjust to local practices.

| | 75 Beds | 100-175 Beds | 200-300 Beds |
|---|------------|-----------------|-----------------|
| <u>Movable--Major Depreciable Equipment - Continued</u> | | | |
| Iron, electric | 1 | 1 | 1 |
| Rack, garment* | 1 | 2 | 3 |
| Table, locking casters | | | |
| Linen folding, 30 x 96 inches | 1 | 1 | 1 |
| Shake-out with sloping sides, 48 x 84 inches | 1 | 1 | 1 |
| Work, 30 x 96 inches | 1 | 1 | 1 |
| Truck, clean linen | 5 | 6 | 10 |
| <u>TOILET, LOCKER ROOM, AND SHOWER</u> | | | |
| | 1 | 1 | 1 |

Fixed Equipment

| | | | |
|--|---|---|----|
| Bar, towel | 1 | 1 | 1 |
| Dispenser | | | |
| Paper towel | 1 | 1 | 1 |
| Soap | 1 | 1 | 1 |
| Fixture, toilet paper | 1 | 1 | 1 |
| Hook, clothes | 2 | 2 | 2 |
| Lavatory, blade handles | 1 | 1 | 1 |
| Light above lavatory | 1 | 1 | 1 |
| Locker, clothes, steel, 15 x 18 x 60 inches | 6 | 8 | 10 |
| Mirror above lavatory | 1 | 1 | 1 |
| Receptacle | | | |
| Soap | 1 | 1 | 1 |
| Waste, wall recessed | 1 | 1 | 1 |
| Seat, built-in, dressing compartment | 1 | 1 | 1 |
| Shelf above lavatory | 1 | 1 | 1 |
| Shower and dressing compartment with curtain rods | 1 | 1 | 1 |
| Water closet | 1 | 1 | 1 |

Movable--Major Depreciable Equipment

| | | | |
|--|---|---|---|
| Chair, straight | 2 | 3 | 4 |
| <u>CLEAN LINEN AND PACK PREPARATION ROOM</u> | | | |
| | 1 | 1 | 1 |

Fixed Equipment

| | | | |
|---|---|---|---|
| Board, bulletin, 26 x 24 inches | 1 | 1 | 1 |
| Clock, electric | 1 | 1 | 1 |
| Counter, linen stacking, pass-through from clean linen processing room | 1 | 1 | 1 |
| Window, pass-through, locking, above counter | 1 | 1 | 1 |

Movable--Major Depreciable Equipment

| | | | |
|---|---|---|----|
| Table, locking casters | | | |
| Linen inspection, transilluminated, 36 x 72 inches | 1 | 1 | 1 |
| Pack making, 30 x 96 inches | 1 | 1 | 1 |
| Work, 30 x 96 inches | 1 | 1 | 1 |
| Cart, clean linen, enclosed, adjustable shelves and partitions | 4 | 7 | 11 |

| | | | |
|-----------------------|---|---|---|
| SEWING ROOM | 1 | 1 | 1 |
|-----------------------|---|---|---|

Fixed Equipment

| | | | |
|---|---|---|---|
| Board, bulletin, 26 x 24 inches | 1 | 1 | 1 |
| Cabinet, wall | 1 | 1 | 1 |
| Clock, electric | 1 | 1 | 1 |
| Counter, 36 inches high, open below | 1 | 1 | 1 |

Movable--Major Depreciable Equipment

| | | | |
|---|---|---|---|
| Chair, straight | 2 | 3 | 4 |
| Hamper, linen | 1 | 2 | 3 |
| Machine | | | |
| Marking, linen, foot, hand, or electric with accessories | 1 | 1 | 1 |
| Patching, thermo-type | 1 | 1 | 1 |

LINEN

Movable--Minor Nondepreciable Equipment

| | (doz.) | (doz.) | (doz.) |
|---|--------|--------|--------|
| Apron, cotton twill with bib (1 per bed) | 6 | 12 | 24 |
| Bag, laundry | | | |
| Hamper (1/2 per bed) | 4 | 8 | 12 |
| Isolation, identified (1/4 per bed) | 2 | 4 | 6 |
| Net, assorted sizes (1/4 per bed) | 2 | 4 | 6 |
| Bib** (6 per crib) | 2 | 4 | 6 |
| Binder | | | |
| Abdominal | | | |
| Infant (5 per bassinet) | 30 | 72 | 125 |
| Large | 2 | 4 | 8 |
| Medium | 4 | 8 | 12 |
| Small | 2 | 4 | 8 |
| Breast | | | |
| Large | 2 | 4 | 8 |
| Medium | 4 | 8 | 16 |
| Small | 2 | 4 | 8 |
| Scutetus | 4 | 8 | 16 |
| T** | | | |
| Female | 4 | 8 | 16 |
| Male | 2 | 4 | 8 |
| Blanket | | | |
| Bassinet, cotton, 30 x 40 inches (10 per bassinet) | 14 | 34 | 50 |
| Bed | | | |
| Cellular cotton or wool (2 per bed) | 12 | 30 | 50 |
| Cotton (3 per bed) | 20 | 40 | 70 |
| Cap** | | | |
| Cook | 2 | 4 | 8 |
| Scrub | | | |
| Nurse | 8 | 16 | 32 |
| Surgeon | 4 | 8 | 16 |
| Cloth, dust** | 4 | 8 | 16 |
| Cover | | | |
| Hot water bottle-ice combination** (1 1/2 per bed) | 12 | 20 | 30 |
| Ice collar** (1/2 per bed) | 3 | 7 | 12 |
| Mattress*** | | | |
| Bed (2 per bed) | 12 | 30 | 50 |
| Crib (6 per crib) | 2 | 4 | 6 |

* Needed if uniforms are processed. Adjust to local practices.

** Disposable may be preferred.

*** Not needed if plastic covered mattress used.

| | 75 Beds | 100-175 Beds | 200-300 Beds | | 75 Beds | 100-175 Beds | 200-300 Beds |
|---|------------|-----------------|-----------------|--|------------|-----------------|-----------------|
| ble--Minor Nondepreciable ment - Continued | (doz.) | (doz.) | (doz.) | | | | |
| ress* (continued) | | | | Pillowcase | | | |
| uth bed (2 per youth bed) | 1 | 2 | 3 | Small (3 per bed) | 18 | 43 | 75 |
| ow, plastic | | | | Standard (12 per bed) | 75 | 175 | 300 |
| all (1 per bed) | 6 | 14 | 25 | | (sets) | (sets) | (sets) |
| andard (2 1/2 per bed) | 15 | 36 | 62 | Restraints | 2 | 4 | 8 |
| o, conductive, assorted sizes** | 5 | 10 | 20 | | (doz.) | (doz.) | (doz.) |
| le, mayo, identified | 3 | 5 | 12 | Robe, bath | | | |
| in | | | | Adult | 2 | 4 | 8 |
| icle | 10 | 20 | 40 | Child | 4 | 8 | 16 |
| ver | 8 | 16 | 32 | Sheet | | | |
| r** (30 per bassinnet) | 40 | 100 | 150 | Bed | | | |
| tal | 1 | 2 | 4 | Hospital, 72 x 108 inches (12 per bed) | 75 | 175 | 300 |
| mining | | | | Youth, 54 x 90 inches | | | |
| gular | 4 | 8 | 12 | (12 per youth bed) | 4 | 8 | 12 |
| ray, identified | 3 | 6 | 9 | Crib, 45 x 72 inches (12 per crib) | 4 | 8 | 12 |
| ation, identified | 2 | 6 | 8 | Draw, 54 x 72 inches (4 per bed) | 25 | 58 | 100 |
| ent | | | | Laporatomy, identified, | | | |
| ult | | | | 72 x 90 inches | 2 | 5 | 14 |
| arge (2 per bed) | 12 | 30 | 50 | Perineal or gynecological, identified, | | | |
| edium (4 per bed) | 25 | 58 | 100 | 72 x 99 inches | 2 | 4 | 8 |
| small (2 per bed) | 12 | 30 | 50 | Surgical, identified, 96 x 108 inches | 6 | 10 | 12 |
| ild | | | | Shirt, infant (8 per bassinnet) | 10 | 26 | 40 |
| arge (6 per youth bed) | 2 | 4 | 6 | Spread | | | |
| edium (9 per crib) | 3 | 6 | 9 | Bed | | | |
| small (12 per crib) | 4 | 8 | 12 | Hospital, 72 x 108 inches (4 per bed) | 30 | 60 | 120 |
| fant (6 per bassinnet) | 8 | 20 | 30 | Youth, 63 x 90 inches | | | |
| ub, nurses, assorted sizes | 3 | 6 | 12 | (3 per youth bed) | 1 | 2 | 3 |
| geon | | | | Crib, 45 x 72 inches (3 per crib) | 1 | 2 | 3 |
| trge | 4 | 8 | 12 | Sult, scrub, surgeon, assorted sizes | 4 | 8 | 16 |
| edium | 6 | 10 | 20 | Towel | | | |
| small | 8 | 12 | 25 | Bath, terry, 20 x 40 inches | | | |
| | (pairs) | (pairs) | (pairs) | (6 per bed) | 40 | 87 | 150 |
| ings** | | | | Huck, hand and face, 17 x 32 inches | | | |
| tetrical | 12 | 24 | 40 | (8 per bed) | 50 | 116 | 200 |
| gical | 36 | 72 | 96 | Surgical, identified, 18 x 36 inches | 50 | 100 | 200 |
| | (doz.) | (doz.) | (doz.) | Tea, crash, 17 x 32 inches | 15 | 30 | 60 |
| o, surgical** | 50 | 100 | 200 | Uniform, assorted sizes | | | |
| bath, cotton** | 3 | 6 | 10 | Maid | 4 | 12 | 20 |
| mattress | | | | Porter | 2 | 3 | 6 |
| sinet (10 per bassinnet) | 14 | 34 | 50 | Washcloth, terry, 12 x 12 inches | | | |
| ospital (6 per bed) | 37 | 87 | 150 | (12 per bed) | 75 | 175 | 300 |
| outh (6 per youth bed) | 2 | 4 | 6 | Wrapper** | | | |
| b (6 per crib) | 2 | 4 | 6 | 10 x 10 inches | 10 | 20 | 30 |
| na | | | | 20 x 20 inches | 20 | 30 | 40 |
| it | 2 | 4 | 8 | 30 x 30 inches | 20 | 30 | 40 |
| ld | 4 | 8 | 16 | 40 x 40 inches | 10 | 20 | 30 |
| w | | | | 72 x 72 inches, extra heavy duty | 10 | 20 | 30 |
| all, soft (1 per bed) | 6 | 14 | 25 | SUPPLIES | | | |
| andard, medium (2 per bed) | 12 | 26 | 50 | Washing compounds, soaps, bleaches, and | | | |
| | | | | miscellaneous supplies based on individual | | | |
| | | | | requirements. | | | |

ot needed if plastic covered mattress used.
isposable may be preferred.

REFERENCES

1. Is One Head Better Than Two? Institutions Magazine, 52(3):55. March 1963.
2. Laundry, Linen Merger Ups Overall Efficiency. American Laundry Digest, 30:82-4. January 15, 1965.
3. Handshu, Irving and Moss, James H. How to Eliminate Hospital Linen Problems. The Modern Hospital, 103(6):95-7, 134-6. December 1964.
4. Tew, Mrs. Willard K. (Ed.). Good Supply of Linen is Necessary. Southern Hospitals, 29:45. April 1961.
5. LM Salaries. American Laundry Digest, 24(7):74-81. July 16, 1959.
6. Arnold, L. A Sanitary Study of Commercial Laundry Practices. American Journal of Public Health, 28:839-44. 1938.
7. Church, Brooks D. and Loosli, Clayton G. The Role of the Laundry in the Recontamination of Washed Bedding. Journal of Infectious Diseases, 93:65-74. July-August 1953.
8. Yasinski, William A.; Pazowski, Joseph P.; Snell, Woodrow J.; and Thibodeau, Joseph E. They Divided the Laundry and Reduced Contamination. The Modern Hospital, 105:148-53, 178. October 1965.
9. Standard Handbook for Electrical Engineers, 9th Edition, (tables 17-80). McGraw Hill Book Co., Inc. 1957.
10. Griffith, J. W. Analysis of Reflected Glare and Visual Effect from Windows. Illuminating Engineering. pp. 184-88. March 1964.

HOSPITAL AND MEDICAL FACILITIES SERIES

"Publications of the Division of Hospital and Medical Facilities,"
Public Health Service Publication No. 930-G-3 (Revised 1965), will
be provided upon request. For a free single copy, write to:

Division of Hospital and Medical Facilities
Public Health Service
U.S. Department of Health, Education, and Welfare
Washington, D.C. 20201

This annotated bibliography presents a brief description of each
of the publications issued in the following general subdivisions:

The Hill-Burton Program
Health Professions Education
Facilities for the Mentally Retarded
Mental Health Facilities

Publications must be ordered by their complete title and publication
number.